

**U.S. FISH AND WILDLIFE SERVICE  
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Harrisia aboriginum* Small ex Britton & Rose

COMMON NAME: Aboriginal pricklyapple or shellmound applecactus

LEAD REGION: 4

INFORMATION CURRENT AS OF: March 2006

**STATUS/ACTION:**

☐ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

☒ New candidate

☐ Continuing candidate

☒ Non-petitioned

☐ Petitioned - Date petition received:

☐ 90-day positive - FR date:

☐ 12-month warranted but precluded - FR date:

☐ Did the petition request a reclassification of a listed species?

**FOR PETITIONED CANDIDATE SPECIES:**

a. Is listing warranted (if yes, see summary of threats below)?

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions?

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.

☐ Listing priority change

Former LP:

New LP:

Date when the species first became a Candidate (as currently defined):

☐ Candidate removal: Former LP:

☐ A - Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

☐ U - Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

☐ F - Range is no longer a U.S. territory.

☐ I - Insufficient information exists on biological vulnerability and threats to support listing.

☐ M - Taxon mistakenly included in past notice of review.

☐ N - Taxon may not meet the Act's definition of "species."

☐ X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering plants, Cactaceae, Cactus Family

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Florida, U.S.A.

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Florida, Sarasota, Charlotte, Lee Counties, U.S.A.

**LAND OWNERSHIP:**

Land ownership is mixed. The known localities for this plant are:

- Private conservation lands: Water Club Preserve on Longboat Key in City of Sarasota; Historic Spanish Point in Sarasota County; Gasparilla Island in Charlotte and Lee Counties.
- Private non-conservation lands: Cayo Pelau in Lee County; Gatehouse at North Manasota Key near Manasota Beach Park and nearby vacant lot in Sarasota County.
- Non-Federal public conservation lands: Manasota Beach Park on North Manasota Key in Sarasota County; Bogges Ridge and Big Mound on Cape Haze Peninsula at Charlotte Harbor Preserve State Park in Charlotte County; Bocilla Preserve on Bokeelia Island in Lee County; Cayo Costa Island on Cayo Costa State Park in Lee County.
- Non-Federal public non-conservation lands: Gasparilla Island Mosquito Ditch site in Lee County; roadside portion of North Manasota Key population in Sarasota County; Kitchen Key in Charlotte County.
- Federal lands: Buck Key on J.N. "Ding" Darling National Wildlife Refuge in Lee County.

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**BIOLOGICAL INFORMATION:**

Species Description: Cylindrical-stemmed cactus with "columnar stems upright or reclining with 9-11 ridges up to 6m (20 ft) base to tip (Anderson 2001; Coile 2000; Ward 1979). Multiple stems from single base, though rarely branched, sprawling (Anderson 2001; Ward 1979). Spines 7-9 per areole, up to 1 cm (0.4 in) long, needle-like, pink-brown at first, becoming gray-brown with age (Anderson 2001). Flowers night blooming, whitish, floral tubes with stiff brown hairs (Anderson 2001; Coile 2000). Fruits globose, green, ripening to lemon-yellow, 6-7.5 cm (2.4-3 in) in diameter (Anderson 2001; Coile 2000)." (Fairchild Tropical Botanic Garden 2001).

Taxonomy: *Harrisia aboriginum* was described by John Kunkel Small after he discovered it on Terra Ceia Island in Manatee County, Florida, in 1919. Small's name for this plant was published in a monograph of the cactus family by Britton and Rose (1920). This name is still in use (Parfitt and Gibson 2004, Wunderlin and Hansen 2005), although possible alternative names for the species were proposed over the years. The following nomenclatural synonyms are cited in the Flora of North America (Parfitt and Gibson 2004): *Cereus aboriginum* (Small ex Britton & Rose) Little, *C. gracilis* var. *aboriginus* (Small ex Britton & Rose) L. D. Benson, *Harrisia donae-antoniae* Hooten.

Elbert Little (1945) transferred this member of the genus *Harrisia* to the genus *Cereus*. He did

not explain the rationale for this transfer in his nomenclatural note. Lyman Benson (1969) published the scientific names (technically, combinations of existing names) needed to treat two of the prickly-apple cacti in southern Florida (*H. aboriginum* and *H. simpsonii*), as well as the similar *H. gracilis* in Jamaica, as a single species consisting of three varieties. Benson placed the *Harrisia* cacti within the genus *Cereus*, making the name for the aboriginal pricklyapple *Cereus gracilis* var. *aboriginum*. Austin's (1984) comparisons showed that *H. aboriginum* and *H. simpsonii* are rather weakly distinct, but he treated them as distinct species. Ward (2004) published the new nomenclatural combination *Harrisia gracilis* (Mill.) Britton var. *aboriginum* (Small ex Britton & Rose) D. B. Ward. This was strictly a nomenclatural publication.

Mark Hooten (1991) published his opinion that an additional species of prickly-apple cactus should be recognized from Buck Island in coastal Lee County, based on plants whose flower buds had white hairs rather than brown. The name he provided, *H. donae-antoniae*, was not validly published because no Latin diagnosis was provided, so the name is illegitimate and must be nomenclaturally rejected. Other botanists consider that Hooten's plants represent *H. aboriginum* (R. Wunderlin, University of South Florida, pers. comm. to K. Bradley, The Institute for Regional Conservation 2003; Parfitt and Gibson 2004; Wunderlin and Hansen 2005). Thus, *H. aboriginum* includes plants on Buck Key that Hooten would have considered to represent a distinct species.

Finally, a book on the cactus family by Anderson (2001) recognizes *Harrisia aboriginum*, but also includes *H. gracilis* of Jamaica in the Florida flora (with *Harrisia donae-antoniae* as a synonym), meaning that Anderson apparently considered Hooten's plants from Buck Key to be indistinguishable from similar plants from Jamaica. The Flora of North American (Parfitt and Gibson 2004) recognizes *Harrisia aboriginum*, noting *Harrisia donae-antoniae* as "an invalid name for a local Florida variant of *H. aboriginum*."

The Regulated Plant Index of the Florida Department of Agriculture and Consumer Services is regularly reviewed by the Endangered Plant Advisory Council, whose members until recently included Daniel Austin (Florida Atlantic University) and Daniel B. Ward (University of Florida). The Regulated Plant Index comprises only full species, not infraspecific taxa. The Index includes *Harrisia gracilis*. Notes that are not part of the official Index explain that *Harrisia gracilis* includes *Harrisia aboriginum* from the Florida west coast and *Harrisia simpsonii* from the Florida east coast (Coile and Garland 2003). The notes' unstated conclusion is that *H. aboriginum* can be considered a variety of *H. gracilis*, which would be consistent with the views of the systematists who were Council members. The U.S. Department of Agriculture's PLANTS database (2005) and the associated Integrated Taxonomic Information System (ITIS) (2005) use the name *Harrisia aboriginum*, as does NatureServe (2005), relying on Kartesz (1994, 1999). The online Atlas of Florida Vascular Plants (Wunderlin and Hansen 2005) uses the name *Harrisia aboriginum*, as does the Guide to the Vascular Plants of Florida (Wunderlin and Hansen 2003).

In summary, there is consensus that *Harrisia aboriginum* is a distinct taxon, whether it is recognized as a full species or as a variety. We have carefully reviewed the available taxonomic information to reach the conclusion that the species is a valid taxon.

The common name “aboriginal pricklyapples” is used by Bradley et al. (2004). Wunderlin and Hansen (2005) use “prickly applecactus” and “west coast prickly-apple.” “Shellmound applecactus” was used by Little (1945). Parfitt and Gibson (2004) suggest “yellow prickly apple, aboriginal prickly apple, prickly applecactus.”

Habitat: The survey by Bradley et al. (2004) shows that the cactus occurs in coastal strand vegetation (relatively low salt-tolerant shrubs and grasses), tropical coastal hammocks with trees including gumbo limbo (*Bursera simaruba*), wild lime (*Zanthoxylum fagara*), or live oak (*Quercus virginiana*). Populations are likely to be on shell mounds created by pre-European local residents, or at least on sites with shelly substrates. Plants may be quite close to the mangrove zone, but not in it. A herbarium specimen at Fairchild Tropical Botanic Garden (Possley 29, collected 2001) is from Buck Key, “rare in ecotone between coastal hammock and mangrove” in Lee County. Further site-specific information is provided below.

Historical Range/Distribution: Gann et al. (2002) summarized the collecting history. The first collection was by A. S. Hitchcock in Lee County in 1900, as reported in a Service-sponsored status survey by Austin et al. (1980). A single collection was made in 1911 in Osprey in Sarasota County by John G. Webb (Bradley et al. 2004). John Kunkel Small collected the plant on Terra Ceia Island, Manatee County in 1919; this is the type locality (Gann et al. 2002, New York Botanical Garden Virtual Herbarium). In 1979, Daniel Austin and Sandra K. Austin collected this species on Buck Key, which is adjacent to Captiva Island. About the same time, Mark L. Hooten also collected plants from Buck Island, and intended to describe them as a new species (as explained above under “taxonomy”). The survey by Morris and Miller (1981) reported aboriginal pricklyapple for four sites: Longboat Key, Manasota Key (2 sites), and Live Oak Key (Kitchen Key, just off of Gasparilla Island, not to be confused with a Kitchen Key in Manatee County). The four sites together had approximately 371 clumps of plants, and all four sites were privately owned (Morris and Miller 1981).

In summary, the historic range of this species appears to have been from Terra Ceia Island south about 125 kilometers (78 miles) to Buck Key. Bradley et al. (2004) state that “there have been several erroneous reports of *H. aboriginum*. Lakela & Craighead (1965) reported it for Collier County. Long & Lakela (1976) reported it for the 10,000 Islands and the Florida Keys. Avery and Loope (1980) reported it for Everglades National Park, presumably based on the 10,000 Islands reference in Long & Lakela (1971). Hammer & Bradley (1998) and subsequently Stalter et al. reported it for Biscayne National Park in Miami-Dade County, where only *H. simpsonii* occurs. Austin (1980) also discussed a specimen (Small s.n., NY) collected in St. Lucie County that had been annotated as *Cereus gracilis* var. *aboriginum* by Lyman Benson. This annotation seems to have been in error, since it was not reported for that county by Benson (1982). This was almost certainly a specimen of *H. fragrans*.”

Current Range/Distribution: The status survey by Bradley et al. (2004) included an examination of the available literature and herbarium specimens, and consultation with knowledgeable field biologists. Bradley et al. (2004) visited 16 properties from Terra Ceia Island south to Delnor Wiggins State Park. The status survey confirmed populations at the following 10 locations:

- Water Club Preserve, Longboat Key, Sarasota County (4-acre private conservation area)
- Historic Spanish Point, Sarasota County (small conservation area owned by the Gulf Coast

Heritage Association, Inc., a nonprofit organization)

- North Manasota Key, Sarasota County (including Manasota Beach Park, the guard house at the entrance to a private community, a vacant lot, and a roadside)
- Charlotte Harbor Preserve State Park (formerly Charlotte Harbor State Buffer Preserve), southern Cape Haze Peninsula, Charlotte County (Bogges Ridge and Big Mound)
- Kitchen Key (also known as Live Oak Key), a peninsula attached to Gasparilla Island, 1.5 km (0.9 mile) from the northern end of the island, and south of the causeway from the mainland (owned by Charlotte County). This includes a tract owned by the Gasparilla Island Conservation and Improvement Association.
- Cayo Pelau, Lee County (privately owned)
- Gasparilla Island Mosquito Ditch site (owned by Lee County)
- Bocilla Preserve, Bokeelia Island (owned by Lee County)
- Cayo Costa Island, Cayo Costa State Park, Lee County
- Buck Key, J.N. "Ding" Darling National Wildlife Refuge, Lee County

These 10 locations occur along a 100 km (62 miles) stretch of coast. The species was not found in Manatee County, where it formerly occurred. The survey provided exact locations of all the clumps of plants. The areas they occupy are quite small, totaling perhaps 100 acres, depending on how generously one draws lines around shell mounds in larger preserves on conservation lands. The surveyors asked many individuals familiar with the coast about possible sites, and used up-to-date aerial imagery. They made use of a detailed previous survey by Morris and Miller (1981). Due to coastal development, there is little possibility of more than a few additional plants being found in Sarasota or Manatee Counties. The islands and wetlands near the entrance to Charlotte Harbor are difficult of access, so it is impossible to exclude the possibility of finding additional plants of *Harrisia aboriginum*. However, the larger shell mounds and other upland areas are identifiable from aerial photographs, and have been visited fairly often due to their interesting plant life and important archaeological sites. The main prospect for additional locations for *Harrisia aboriginum* may be from the vicinity of Marco Island southward, including the Ten Thousand Islands, which are primarily mangrove, but have small uplands with hardwoods and several Pre-Columbian sites. Ten Thousand Islands National Wildlife Refuge has not had a thorough survey of its flora. Additionally, parts of coastal Everglades National Park are remote, and we cannot exclude the possibility that *Harrisia aboriginum* occurs there. It is, however, extremely unlikely that *Harrisia aboriginum* is present in better-explored areas, from Flamingo in Everglades National Park eastward on the mainland, or in the Florida Keys.

Population Estimates/Status (all data are from Bradley et al. 2004) with summary of threats (more detail on threats follows):

- Water Club Preserve. Five plants in three groups. This is part of a residential community and has no formal protection. Invasive exotic plants such as Brazilian pepper (*Schinus terebinthifolius*) threaten the area, and the lack of prescribed fire may also be a problem; Bradley et al. (2004) suggest that this area, which appears to be shrubby, was once coastal strand vegetation.
- Historic Spanish Point. Two adult plants on a shell mound. They are largely surrounded by

native shrubs, but exotic plants including asparagus fern (*Asparagus densiflorus*), bowstring hemp (*Sansevieria hyacinthoides*), and the cactus, *Hylocereus undatus*, threaten the population. This could be the locality where Webb made his collection in 1911.

- North Manasota Key.
  - Manasota Beach Park. Two groups of plants. The coastal strand vegetation is relatively intact. “Plants are threatened by park visitors’ activities, including wildfires, trash dumping, and general abuse of the habitat” (Bradley et al. 2004). Exotic plants also constitute a threat, they include Madagascar periwinkle (*Catharanthus roseus*), Brazilian pepper, introduced cactus (*Selenicereus pteranthus*), and St. Augustine grass (*Stenotaphrum secundatum*).
  - Guard house at the entrance to a private community, adjoining the Manasota Beach Park. Two plants. Their status is precarious; at the time of the survey, mulch was being spread for landscaping purposes.
  - Vacant lot. Nineteen plants. Exotics, including the cactus *Hylocereus undatus*, Brazilian pepper, St. Augustine grass, and the flowering tree *Tabebuia aurea* are problems. The primary threat is development. The Sarasota County Appraiser’s office lists the value of the Gulf-facing lot near \$400,000. Few empty lots remain on this narrow barrier island.
  - Roadside near northern terminus of road. One plant. Located in shady coastal berm/maritime hammock vegetation.
- Charlotte Harbor Preserve State Park.
  - Bogges Ridge. Coastal berm with 36 plants. Disturbance by boaters landing at the site may be a problem.
  - Big Mound. Three plants on 20-acre shell mound with tropical trees and shrubs. The cactus has been known from this site since 1981, when it was observed by Morris and Miller (1981). Human disturbance and exotic pest plants such as Brazilian pepper are a serious problem. Hurricane Charley struck this area on August 13, 2004, with its most intense winds, perhaps 120 miles per hour (NOAA 2004). The plants appear to have fared well, perhaps due to the lack of a severe storm surge.
- Kitchen Key, also known as Live Oak Key. Fewer than 10 plants, on coastal berm with live oak and cabbage palm (*Sabal palmetto*). While this area is owned by Charlotte County, it is not being managed for conservation purposes. Exotic pest plants, especially Brazilian pepper, are threats. Present-day and future sea level rise may be a threat. Bradley et al. (2004) note that cabbage palms are dying, probably due to excessive salinity. This site was hit by Hurricane Charley.
- Cayo Pelau. Seven plants were found on a low shell mound with coastal strand and coastal hammock plants (including gumbo-limbo and grey nickerbean, which creates impenetrable spiny thickets). This is an island north of Charlotte Harbor, forming the western boundary of Bull Bay. Its north end is in Charlotte County. The southern tip of the island constitutes Little Cape Haze. Robert Repenning brought attention to this site in 2003. Exotic pest plants including Brazilian pepper and Australian pine are threats. The island is privately owned.
- Gasparilla Island.
  - Conservation and Improvement Association Tract A, Lee County. This site is a short distance south of Kitchen Key, and has a single cactus plant on a “thin upland strip along the tidal swamp shoreline.” Fragrant pricklyapple was

observed in 1998 by Rick Joyce, and was mapped by George Gann and others in 2001 (Bradley et al. 2004). Exotic pest plants and sea level rise are threats.

- Mosquito Ditch site. One large plant or colony (approximately 500 stems, with the tallest stem about 2.5 meters [8.2 feet] tall). When visited, this plant (or colony) on shell spoil from a mosquito-control ditch was growing directly under Australian pine, Brazilian pepper, and the native wild lime (*Zanthoxylum fagara*). The extent of hurricane damage from 2004 is being assessed by The Institute for Regional Conservation. Exotic pest plants are a threat, as are introduced iguanas, which eat the flowers. Aboriginal pricklyapple was first observed here by Clyde Nabers in 2001.
- Bocilla Preserve, Bokeelia Island. Six groups of plants comprising several hundred individuals are on a coastal berm surrounded by tidal swamp. Brazilian pepper and Australian pine are threats. This island is at the northern tip of the much larger Pine Island. Aboriginal pricklyapple was first reported in 1991. The site is owned by Lee County, but is not managed for conservation purposes.
- Cayo Costa Island, Cayo Costa State Park. A single plant was present in 2003, in a coastal grassland on a shelly substrate. This Gulf barrier island is one mile south of Gasparilla Island and 5.5 miles west of Pine Island. It has been known since 1977 (Herwitz 1997). Keith Bradley (in litt. 2004) stated that it had been reported to The Institute for Regional Conservation that the sole plant on Cayo Costa Island was alive, but in poor condition, prompting park biologists to consider taking cuttings to maintain the plant temporarily in cultivation.
- Buck Key, J.N. “Ding” Darling National Wildlife Refuge and Sanibel-Captiva Conservation Foundation conservation lands. Richard Workman reported 100 to 200 plants in 2000 (pers. comm. to K. Bradley) and several dozen plants were observed and mapped by biologists from The Institute for Regional Conservation and Fairchild Tropical Botanic Garden in 2001. Buck Key is located off the east side of Captiva Island. Most of the plants are on land owned by the Refuge. They occur with gumbo-limbo and Florida strangler fig. Private portions of Buck Key are likely to be developed (Bradley et al. 2004), resulting in loss of that portion of the population.

The Institute for Regional Conservation is revisiting *Harrisia aboriginum* sites to assess damage from Hurricane Charley and other storms. Keith Bradley (pers. comm. 2006) reports that except for a plant damaged at Buck Key, *Harrisia aboriginum* appears to be thriving in newly open, sunny habitat.

#### THREATS:

- A. The present or threatened destruction, modification, or curtailment of its habitat or range. Based on the extent of coastal development in Manatee and Sarasota Counties and this species' former presence at Terra Ceia, it is likely that many populations were destroyed by development. This plant currently exists at only 10 locations and the viability of existing populations is questionable (Fairchild Tropical Garden 2001).

As noted in “population estimates/status” section above, at least three of the currently occupied sites are threatened by development

- at Water Club Preserve, Manasota Key, one part of the four-acre conservation area in this development had been bulldozed (Bradley et al. 2004)
- at a guard house at the entrance to a private community on North Manasota Key, landscaping work was threatening the two *Harrisia aboriginum* plants.
- one of the last vacant Gulf-front lots on North Manasota Key is vulnerable to development.

The spread of Brazilian pepper and Australian pine, both nonnative species, has greatly altered coastal vegetation. Herwitz et al. (1996) showed that on Cayo Costa, the coastal strand habitat had experienced dramatic increases in Australian pine between 1975-1977 and 1990-1992, and that Brazilian pepper had spread dramatically in other habitats, and had become a dominant woody plant species. They concluded that expanding populations of these species “appear to be closely related to the decrease in species number and the reduced population sizes of many resident species.” Habitat loss to these plants is largely historic because managers of public conservation lands are committed to restoration of native vegetation. Australian pine, a tall tree producing deep shade and abundant litter, also appears to kill native plants through allelopathy. It forms single-species stands, excluding essentially all native species. Brazilian pepper also tends to form shaded single-species stands. *Harrisia aboriginum* requires open conditions and nearly full sunlight, so it will not persist in thickets. The Manasota Beach Park population in Sarasota County is encroached upon by Madagascar periwinkle, princess-of-the-night cactus (*Selenicereus pteranthus*), and St. Augustine grass.

Hurricanes and tropical storms are a regular feature of this coast’s climate, but because the populations of this plant are very small and because Australian pines in particular create a great deal of wreckage when they fall in high winds, smothering anything beneath, there is a potential for loss of populations of this species if *Harrisia aboriginum* plants are buried or if exotic pest plants proliferate after disturbance. The Service is sponsoring a post-hurricane survey for *Harrisia aboriginum*. Preliminary results indicate that so far, opening up of coastal habitats has benefited *Harrisia aboriginum* and populations escaped being buried, or overwhelmed by fast-growing Brazilian peppers.

- B. Overutilization for commercial, recreational, scientific, or educational purposes. None known. Cacti are vulnerable to collection, and members of the genus *Harrisia* are collectible. They are on display at facilities such as the Royal Botanic Gardens and they have impressive night-blooming flowers. It is thus prudent for Natureserve (2005) to cite collection as a threat. But the Center for Plant Conservation’s Conservation Action Plan for this species, prepared by Fairchild Tropical Botanic Garden, does not mention overutilization as a threat, and we are not aware that collectors have targeted this particular species.
- C. Disease or predation. Non-native iguanas have been observed to eat flowers of *Harrisia aboriginum* at the Gasparilla Island mosquito ditch site. Iguanas seem to be an emerging problem in the Florida Keys and the Miami urban area, but only anecdotal information is available on their abundance or potential to be damaging. Thus, even though iguanas have been observed eating flowers of this species, we do not have adequate information to show that they constitute a serious threat. Scale insects have been observed as herbivores in some



populations, occasionally causing severe damage to plants (K. Bradley, pers. comm. 2005). In addition, cactus rot, which could be due to a number of causes, has been observed (K. Bradley, pers. comm. 2005). In this situation, the base of the plant begins to die, with rot progressing from the base to the tips of the stems, eventually killing the plant. The extent to which these threats are impacting the species has not been assessed, so at this time we have no information indicating that the species is threatened by disease or predation

- D. The inadequacy of existing regulatory mechanisms. The Florida Department of Agriculture and Consumer Services, using different botanical nomenclature from what the Service has accepted, designated all of *Harrisia gracilis* (including *Harrisia aboriginum* as well as the relatively more widespread *H. simpsonii*) as endangered under Chapter 5B-40, Florida Administrative Code. This listing provides little or no habitat protection beyond the State's Development of Regional Impact process, which serves to disclose impacts from projects, but provides no regulatory protection for State-listed plants on private lands. The Florida Department of Agriculture and Consumer Services listing does not apply to any other Florida state or local governmental agency. Without local or county ordinances preventing the destruction of habitat, conservation does not occur. So far, there has been relatively little interest in protecting native vegetation on private land or encouraging or requiring the use of native plants in landscaping on the barrier islands. However, effective programs exist to encourage restoration of native vegetation and use of native landscaping on public conservation and recreation lands.
- E. Other natural or manmade factors affecting its continued existence. Fairchild Tropical Botanic Garden's (2001) Conservation Action Plan for the species points out that only one of the existing populations might be viable over the long term, although it is not possible to be certain in the absence of genetic information. Only 10 locations of the species are known to exist, 7 have fewer than 10 individuals (including three sites with just 1 individual), and the largest site has no more than 200 individual plants. The small sizes of existing populations of this species exacerbate the risk of local extirpation, even though individual plants spread vegetatively and may be relatively long-lived. Hurricane Charley of 2004 altered shorelines, cut new inlets, and demonstrated the instability of the barrier islands inhabited by the species, even though it caused little damage to *Harrisia aboriginum* populations. These storms can obliterate habitat, and have the potential to destroy entire populations.

## CONSERVATION MEASURES PLANNED OR IMPLEMENTED

The Conservation Action Plan for *Harrisia aboriginum* (Fairchild Tropical Botanic Garden 2001) noted that only the Buck Key population might be viable over the long term, although it is not possible to be certain in the absence of genetic information. None of the populations faced immediate threats, so the plan suggested further surveys (which have been and are being conducted) and a study of the potential for outplanting, including population augmentation or reintroduction. Land acquisition by public agencies, including the Service, has protected a number of populations of this species from development. All of the public land managers within this species' range, including J. N. "Ding" Darling National Wildlife Refuge, have made efforts to control Australian pine, Brazilian pepper, and other pest plants. Bradley et al. (2004) provide site-specific information on threats from pest plants and shading by native shrubs and trees,

which in some areas might be alleviated by use of prescribed fire. Over the short term, Hurricane Charley may have lessened problems from shading, based on preliminary results from surveys (K. Bradley, pers. comm. 2006).

#### SUMMARY OF THREATS (including reasons for addition or removal from candidacy, if appropriate)

*Harrisia aboriginum* is threatened by the historic loss of the great majority of its former potential habitat on barrier islands of Manatee and Sarasota Counties. The species no longer occurs in Manatee County and only a few remnants of habitat, with a few plants, remain in Sarasota County and they are vulnerable to development, landscaping maintenance, and shading by native or exotic shrubs and trees. In Charlotte and Lee Counties, habitat has been lost on a lesser scale, so more plants remain, including what appears to be the only population that may be viable. These sites are vulnerable to hurricane storm surges and require monitoring to ensure that they do not become overgrown by exotic or native shrubs and trees. Over a somewhat longer term, the location of populations at low elevations, just above the mangroves, makes them vulnerable to sea level rise, assuming it continues at the twentieth century rate. Overall, the primary threat is loss and modification of habitat, which has led to existing populations being small, scattered, and few in number.

#### RECOMMENDED CONSERVATION MEASURES

The Conservation Action Plan (Fairchild Tropical Botanic Garden 2001) suggests that because barrier island populations are vulnerable to sea level rise, “introduction attempts in appropriate mainland habitats could forestall some of the effects of sea level rise and increase dispersal to new and appropriate locations. The current populations (less than 100 miles apart) could also be severely negatively impacted by a single hurricane or tropical storm; introduction could increase this range and decrease the probability of storm damage to the entire species.” One augmentation attempt has been made and one introduction attempt is currently ongoing (both by the Sanibel-Captiva Conservation Foundation).

Continued work is needed to control invasive pest plants at populations. The Conservation Action Plan suggests that available land at highly disturbed sites can be restored to native vegetation, including *Harrisia aboriginum* where appropriate. This could serve to increase the number of populations of this species without affecting the functioning of any natural areas that do not currently provide habitat to this species. Further study of the potential for introductions is warranted.

The Conservation Action Plan also suggests that surveys and vigilance for undiscovered populations are warranted. Fairchild Tropical Botanic Garden informed the Mosquito Control Officer for Lee County of this species and, and mosquito control personnel will keep watch for any new occurrences.

#### LISTING PRIORITY

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| THREAT             |                 |                       |          |
|--------------------|-----------------|-----------------------|----------|
| Magnitude          | Immediacy       | Taxonomy              | Priority |
| <b>High</b>        | <b>Imminent</b> | Monotypic genus       | 1        |
|                    |                 | <b>Species</b>        | 2*       |
|                    |                 | Subspecies/population | 3        |
|                    | Non-imminent    | Monotypic genus       | 4        |
|                    |                 | Species               | 5        |
|                    |                 | Subspecies/population | 6        |
| Moderate<br>to Low | Imminent        | Monotypic genus       | 7        |
|                    |                 | Species               | 8        |
|                    |                 | Subspecies/population | 9        |
|                    | Non-imminent    | Monotypic genus       | 10       |
|                    |                 | Species               | 11       |
|                    |                 | Subspecies/population | 12       |

#### **Rationale for listing priority number:**

*Magnitude:* This is a rare plant, inherently vulnerable to extinction because of its limited numbers. It is present at only 10 locations, and most of them have only a few plants. Because each population occurs just above sea level along the coast, each is threatened over a time scale of decades by rising sea level. Each population has been threatened by exotic pest plant invasions, although this threat appears to be greatly reduced on publicly-owned conservation lands, including Buck Key, site of the only large population. Predation by introduced iguanas appears to be a problem at one small population, but we do not know the extent to which this threat may impact the species. Some populations occur on private lands where they are all vulnerable to habitat destruction and/or mismanagement. The proximity to the coast, combined with the small number of plants in each population, makes the species vulnerable to hurricane storm surges.

Public land managers are aware of the exotic pest plant problems, and restoration of coastal vegetation in southern Florida has been attempted on an extensive scale with sufficient success to ensure future funding. No count has been made of the extent of publicly-owned sites that could be restored around Charlotte Harbor or at the barrier islands northward to Sarasota Bay, but organizations such as the Sarasota Bay and Charlotte Harbor National Estuary Programs have so far been able to find excellent restoration opportunities; restoration has been limited by the availability of funds rather than the availability of sites. Overall, we do not have sufficient data on the effectiveness of coastal restoration, nor on the feasibility of establishing new *Harrisia aboriginum* populations to assess whether establishing new populations could decrease the magnitude of threat to this species.

*Imminence:* The threats are imminent because known populations are small and possibly only one is viable. While *Harrisia aboriginum* may never have been abundant, nearly all of the barrier islands that it once inhabited north of Charlotte Harbor have been developed, with only tiny fragments of native vegetation remaining. One of those fragments is a valuable Gulf-front lot that could be sold at the owner's discretion. The situation at the mouth of Charlotte Harbor is

better, with reasonable prospects for conservation of public land, at least until sea level rises further. Development of the privately-owned portion of Buck Key could destroy part of the population of *Harrisia aboriginum* and threaten plants on the adjoining National Wildlife Refuge, in part by introducing nonnative plants to the island. This would be a particularly serious situation because Buck Key has by the largest known population of this plant

Yes. Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No. Despite threats over the past 30 years, including the spread of Brazilian pepper, loss of habitat, and a severe hurricane, this species has continued to persist, albeit in small numbers at only 10 populations.

DESCRIPTION OF MONITORING: The Service has funded a post-hurricane survey of this species. Results are not yet available.

#### COORDINATION WITH STATES:

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: The Florida Department of Agriculture and Consumer Services listed this species as endangered more than a decade ago. Florida Park Service personnel have provided status information. J.N. "Ding" Darling National Wildlife Refuge has cooperated with recent surveys and has current information.

Indicate which State(s) did not provide any information or comments: N/A

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Grey literature based on literature analysis:

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Other:

New York Botanical Garden. Virtual Herbarium. Accessed October 6, 2005.  
<http://sciweb.nybg.org/science2/hcol/vasc/index.asp>

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all 12-month petition findings, additions of species to the candidate list, removal of candidate species, and listing priority changes.

Approve: /s/ Jeffrey M. Fleming 3/7/2006  
Acting Regional Director, Fish and Wildlife Service Date



Concur: \_\_\_\_\_ August 22, 2006  
Acting Director, Fish and Wildlife Service Date

Do Not Concur: \_\_\_\_\_  
Director, Fish and Wildlife Service Date

Date of annual review: October 2005; updated March 7, 2006  
Conducted by: David Martin, South Florida Ecological Services Office